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Function Model for Community Health Service Information*

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Abstract

In order to construct a function model of community health service (CHS) information for development of CHS information management system, Integration Definition for Function Modeling (IDEF0), an IEEE standard which is extended from Structured Analysis and Design(SADT) and now is a widely used function modeling method, was used to classifying its information from top to bottom. The contents of every level of the model were described and coded. Then function model for CHS information, which includes 4 super-classes, 15 classes and 28 sub-classed of business function, 43 business processes and 168 business activities, was established. This model can facilitate information management system development and workflow refinement.

Keywords: Health Service; Model; Information System

1. Introduction

Community health service (CHS) plays an important role in National Health Service System. Managing the CHS information by using an information management system (IMS) will enable the normalization of CHS practice and development [1]. However, high risk in developing management information systems has become a bottleneck restricting the progress of CHS informationization [2]. To solve these problems, functional modeling, which is mainly used to decompose and describe CHS functions by taking a top-down and layer by layer approach, might be employed to help professionals of both health and IT understand the CHS business function consistently and thoroughly, which is extremely significant in IMS development.

2. Modeling Method and Tool

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We used the method of Integration Definition for Function Modeling (IDEF0) to establish function model for CHS. IDEF0 is a widely used function modeling method, which is extended from Structured Analysis and Design Technique (SADT) and now is a standard of IEEE [3]. In IDEF0, activities are represented by boxes, data flows companying those activities and their relationships are represented by arrows. General functions are described at the top and detailed ones at lower levels (Fig.1) [4].

In this paper, all function diagrams were described using CA *Technologies* modeling software *BPWin*.

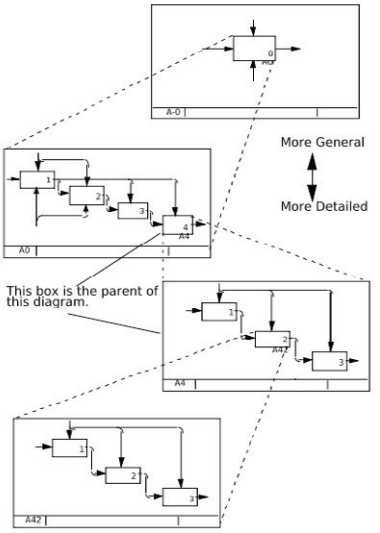

Fig.1 Decomposition structure of IDEF0

3. Modeling Process

IDEF0 was used to decomposing CHS information into business functions, business processes and business activities and then contents of every level were described and coded. During processing downwards, contents of functions are changed gradually from abstract concepts to specific phrases which have practical meanings.

3.1 Business function

Functions are abstracted from main business activities of CHS. The classification of business function should be stable as long as the policies on primary care remain unchanged. For their complexity, business functions are divided into three levels of super-class, class and sub-class. By classifying of business functions, the scope of CHS is defined.

3.2 Business process

Business processes are a group of connected activities in a functional domain covering specific business [5]. One function domain usually contains a number of business processes. When defining a business process, the name, function and a brief description of the business process should be identified. This defining is an iterative process. Every business processes were revised repeatedly to ensure that they

satisfy the business requirements. Defining of business processes should be independent of assignment of each department in an organization, which probably does not concern about business integration.

3.3 Business activity

Every business process can be divided into a number of business activities which are the most basic unit of CHS information and can not be divided further [6]. Each business activity has three characteristics: (1) A clear result. The aim and result of every business activities should be described with a simple phrase or sentence. (2) A clear scope. Within this scope, participants, beginning and end time of every activity should be identified easily. (3) Independence. Every business activity should be almost independent of others.

TABLE1 Classification of Business Function of CHS Information

Super-class	Class	Sub-class
1Health management in community	1.1Management of health records	1.1.1Management of health records
	1.2Health education	1.2.1Health education
	1.3Health care	1.3.1Maternal healthcare1.3.2 Children healthcare1.3.3 Healthcare for seniors1.3.4 Healthcare for poor people1.3.5Healthcare for students
	1.4Rehabilitation	1.4.1Rehabilitation instruction and training
	1.5Mental health service	1.5.1Mental health service
	1.6Family planning service	1.6.1Family planning service
2Public health in community	2.1Disease control and prevention	2.1.1Infection disease2.1.2Endemic disease2.1.3Parasitic diseases2.1.4Chronic disease2.1.5Occupational disease
	2.2Vaccination	2.2.1Vaccination
	2.3Response of public health emergency	2.3.1Reaction to public health emergency
3Basic clinical service in community	3.1Basic medical service	3.1.1Common disease treatment3.1.2 Outpatient health examination3.1.3 Referral
	3.2Family medical service	3.2.1Medical visit at home3.2.2 Home nursing3.2.3Family medical service contract
4Comprehensive management in community	4.1Comprehensive management	4.1.1Comprehensive management
	4.2Health service evaluation	4.2.1Health service evaluation
	4.3Statistics and analysis	4.3.1Vital statistics
	4.4Health information collection	4.4.1Health information collection

4. Modeling Result

The business function of CHS information was classified into 4 super-classes, 15 classes and 28 sub-classes, each of them was coded (Table 1).

There are relationships among business functions of super-classes, classes or sub-classes. Fig.2 represents the relationship among 4 super-classes business functions. Their contents are in accordance with relevant policies, regulations and can be derived from community comprehensive information, personal information and organization information of other information systems.

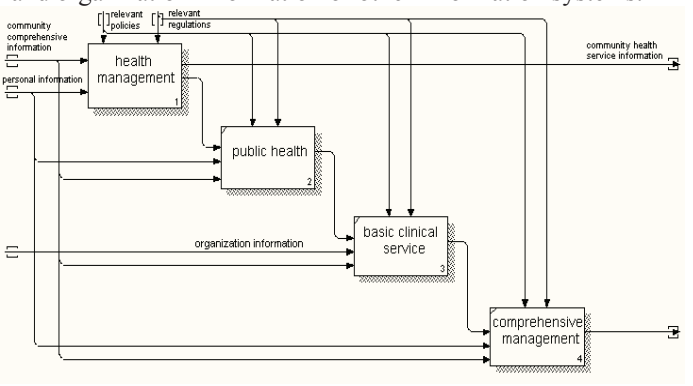

Fig.2 Relationship among super-classes of business function

Business functions are further divided into 43 business processes and 168 business activities. For example, business function *1.3.1 maternal healthcare* is divided into 3 business processes: *examinations during pregnancy*， *delivery, and postpartum care* (Fig.3). Their sequences are in accordance with clinical process. Their contents can be derived from personal information or EHR information. With the data that generated during the business processes, the pregnant woman's EHR will be updated.

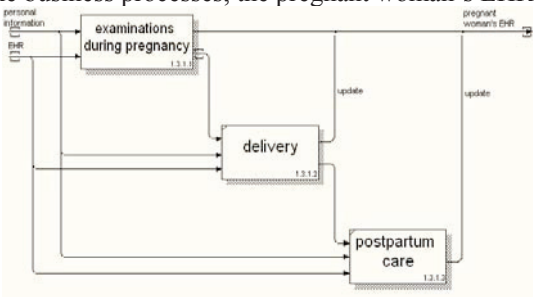

Fig.3 Business processes and their relationship in *maternal healthcare*

Business process examinations during pregnancy can be divided into 5 business activities: health service registration, inquiry, physical examination and lab test, medical guidance and referral (Fig.4). The content of health service registration can be derived from personal information or directly from history EHR information. Information of 5 business activities will be referred for the next business process delivery, and be used to update the EHR of the pregnant woman afterwards.

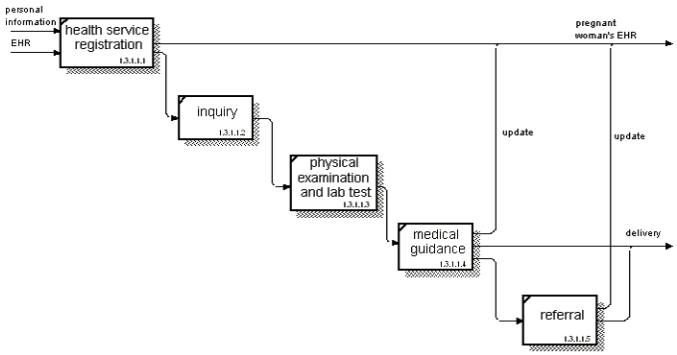

Fig.4 Business activities and their relationships in *examinations during pregnancy*

5. Discussions

The main purposes of this model are as follows: (1) Describe business requirement of IMS and display its comprehensive function that needed to be met. (2) Help system developers to understand business requirement easily, avoiding waste of resources and reducing risk of IT investment. (3) Facilitate refining of workflow in institutions for performance improvement.

Functional model for community health service was designed to guide IMS development. Software engineers might develop a hierarchy of IMS by referring to the structure of business function model. The ideal result of IMS development is that the classification can be corresponded one-to-one with that of the function model. Although the classification of IMS is allowed to be slightly different from that of functional model in reality, the classification at bottom must completely correspond with business activities to ensure that CHS activities can all be represented by IMS. CHS function model is not confined within a given institution or department. It was created by defining *business function, business process* and *business activity* at three levels from the top to the bottom regardless of the specific function or assignment. The CHS information was integrated as a whole when constructing CHS function model. Therefore, the model is universal and should be used commonly in community health institutions.

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